Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/GB05/001040

International filing date: 18 March 2005 (18.03.2005)

Document type: Certified copy of priority document

Document details: Country/Office: GB
Number: 0406121.4
Filing date: 18 March 2004 (18.03.2004)

Date of receipt at the International Bureau: 09 May 2005 (09.05.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)

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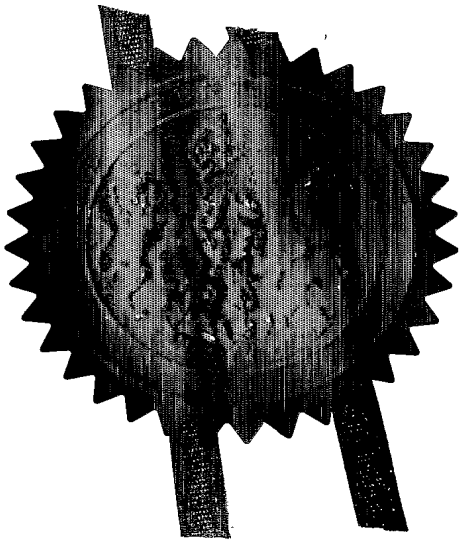

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Dated 8 April 2005

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Your reference **AQA (UK)**

The **Patent Office**

Request for grant of a Patent

Form 1/77 Patents Act 1977

1 Title of invention

A method of generating answers to questions sent from a mobile telephone

0406121.4 18 MAR 2004

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727045700'2

4 Reference Number

AQA (UK)

5 Claiming an earlier application date

An earlier filing date is claimed:

Yes [ ] No [X]

Number of earlier application or patent number

Filing date

15 (4) (Divisional)	8(3)	12(6)	37(4)
[ ]	[ ]	[ ]	[ ]

6 Declaration of priority

Country of filing	Priority Application Number	Filing Date

7 Inventorship

The applicant(s) are the sole inventors/joint inventors

Yes [ ] No [X]

8 Checklist

Continuation sheets

Claims	4	Description	14
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Priority Documents	~~Yes~~/No
Translations of Priority Documents	~~Yes~~/No
Patents Form 7/77	~~Yes~~/No
Patents Form 9/77	Yes/~~No~~
Patents Form 10/77	Yes/~~No~~

9 Request

We request the grant of a patent on the basis of this application

Signed: Origin Limited Date: 18 March 2004

(Origin Limited)

A METHOD OF GENERATING ANSWERS TO QUESTIONS SENT FROM A MOBILE TELEPHONE

FIELD OF THE INVENTION

This invention relates to a method of generating answers to questions sent from a mobile telephone. The term 'mobile telephone' covers any portable device with voice and data communications capability; it therefore extends to cover smart phones, communicators and voice enabled PDAs. Such devices generally have small keyboards and display screens, making conventional web-based searching to obtain answers to 'general information questions' both slow and awkward.

DESCRIPTION OF THE PRIOR ART

The state of the art in information retrieval by conventional internet search engines (e.g. Google™) is to select documents that are in some way related to a user's query and then to rank them in terms of their closeness to matching the original query. A ranked list of documents is retrieved by the search engine and summaries are sent for display on an end-user's browser. It is then up to the user to either select the correct document or to browse the set of ranked documents. Given the huge number of documents available on the Internet, the result is often thousands of documents, many of marginal relevance. This can be a frustrating experience for the user, especially for users who are untrained in how to create effective queries or in interpreting the results.

The vastly increasing amounts of digital information being made available on the Internet will further exacerbate the poor performance of the current systems. While it is to be expected that these systems will improve their algorithms over time, it is likely that the user will still have difficulties as the documents being searched were never explicitly written to answer all the arbitrary queries that can be raised by users.

Capturing the meaning of a natural language query, using that to locate an answer by searching across extensive numbers of documents and then automatically constructing a

natural language answer to that query has long been a goal of artificial intelligence and remains the core direction of research in this area. Because reaching this goal is a distant prospect, specialised services are known which allow end-users to send by e-mail or web browser questions for human researchers to answer. These human based systems are especially useful for answering 'general information questions'; these are questions that are not domain specific, such as questions as to current sports scores, stock prices, weather etc. or other very limited kinds of data. For a completely unconstrained domain of questions, the human researcher, using internet based search engines, is still a reasonably effective, although potentially inefficient, solution. Reference may for example be made to the service 'MojoKnows', which allows a user to send any question via a SMS text message from a mobile phone which will then be researched and answered by people conducting internet based searches and replying with a SMS text message.

SMS text messaging is the most successful mobile telephony data service. The GSM association forecast that 200 billion text messages would be sent over the worldwide GSM networks during 2001 and 360 billion during 2002. In January 2004 the Mobile Data Association (MDA) estimated that 20.5 billion text messages were sent in the UK during 2003, with a daily average in December of 61 million text messages. The MDA forecast that text messaging will reach 23 billion in 2004. Premium text messaging is a development of text messaging, launched initially during 1998 in some Scandinavian countries and followed shortly in the UK. Premium text messaging offers a revenue-sharing model similar to existing premium rate voice (IVR) services. The core principles are that the mobile phone user pays a premium tariff to access value added services or content. The premium rate can be applied either to a user requesting the premium service, mobile originate (MO), or receiving the premium service, mobile terminate (MT).

SUMMARY OF THE INVENTION

The present invention is a method of generating answers to questions sent from a mobile telephone over a wireless beaet. In one implementation it comprises the following steps:

(a) receiving a question sent from the mobile telephone;

(b) processing that question at a first computer that (i) searches a database of previously generated answers for answers that match the question; (ii) automatically generates a list of potential answers to the question from the database; and (iii) automatically sends the unanswered question, together with the list of possible answers, out for review by one or more human researchers, connected to on-line information resources, who then either select one of the answers in the list, or use this list of possible answers together with information from the on-line information sources to compose an answer;

(c) sending the answer in plain text to the mobile telephone.

The answer is preferably a succinct (less than 160 characters) text message. Hence, the present invention combines the strength of current generation AI systems with the undisputed strengths of the human being to understand a question and to search, find and express an answer in cogent and concise terms. By supplying the human researchers with potential answers, this avoids many of the difficult problems of trying to implement real search intelligence in software. Further, if the researcher can pick an answer from the list then the response time in providing that answer will be far quicker than if the researcher has to research the answer directly and from scratch.

The present invention is implemented as a system called AQA™ ("Any Question Answered"). AQA is a premium text service running on mobile phone networks aimed at the consumer market. Consumers will be able to send in any question to the AQA service, via a text message on their mobile phone. Within minutes, AQA will send a text response to the consumer. Given that it is a text service, all responses will be no more than 160 characters in length. There is a simple £1 charge for consumers, plus their network charges associated with sending their text message (which may vary from network to

network), for this service. AQA is able to provide these responses though a combination of an intelligent knowledge engine and a select team of paid researchers.

The service will give an answer for any question presented in any way to the service. A mobile phone user can either submit a question via a £1 premium text message or by a £1.50 premium voice call. In either case the answer is sent back to the questioner via a free text message.

The system to answer questions is based on a hybrid system of (a) computer software ("The Knowledge Engine") that deploys database and information retrieval algorithms, along with (b) human researchers using a web based software system (The Knowledge Entry System). The Knowledge Engine is the "first computer" defined above. It can be a single computer, or a network of computers or any other distribution of computing resources. The Knowledge Entry system is a web based interface that displays to remote researchers the question and a list of possible answers selected by the Knowledge Engine; a countdown timer, and an indicator of the number of outstanding questions.

The key success factors for the service are good quality of answers within a few minutes. The Knowledge Engine ensures these success factors in a number of ways:

1. It will answer certain fact based questions directly, such as share prices and weather reports.
2. It will supply a researcher with the question *plus a number of potential answers from the database of previously given answers.*
3. It will allow the researcher to search the company's answer database to research previous answers.
4. It will rank answers in the list of potential answers in various useful ways, such as date order, closeness of match etc.

The company will implement two tiers of human researchers. The first tier will handle the frontline of questions and will pass on any questions that are hard to research. These hard questions will be researched by a group of senior researchers. An Editor will be placed in charge of the senior researchers to ensure that the company's editorial policy in answering

questions is adhered to by all researchers. The Editor and senior researchers will all be high calibre individuals and will be key employees of the company.

The business will be able to take advantage of the key trends in the industry by delivering a service to answer questions from mobile users using:

(a) Modern information retrieval technology to populate a knowledge database and automatically select appropriate answers from the database to be reviewed by human researchers.

(b) Web based technologies to manage teams of researchers to select, generate and supply answers to questions over the internet.

(c) Improving hardware and software technologies to improve information retrieval systems performance so that 80% or more of questions can be answered from an automatically generated list provided to researchers.

(d) Mobile telephony to provide the AQA service to customers via premium voice and premium text messaging.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described with reference to the AQA implementation, schematically illustrated in Figure 1.

DETAILED DESCRIPTION

How AQA Works

What is the AQA service

The AQA service is a premium number mobile phone service. It enables users to ask any question on their mobile phone and for the system to send a text answer within minutes of receiving the question. The primary method of asking questions is via a premium text number. Initially the service will be launched in the UK where the service number is 63336 for text questions. This number will work across all UK mobile networks and will cost the users £1 plus the network charge per question. Users will not be charged for the text message response.

The billing system is set up within the mobile network operators and is termed a mobile originating 'MO' premium text service. The customer is billed as soon as they send a question. Out of this the company receives a revenue share from the network operators.

Users can ask the question in *any* way including commonly used text-shorthand (like "gr8" for great), misspelled words, incomplete questions, abbreviations etc. In addition an "AQA Command Language" can be used such as ".w london" for weather in London or ".s psion" for latest share price for Psion Plc.

The answer provided is a full description, including:

(i) A restatement of the question asked.

(ii) An answer to the question including details to make the answer specific (e.g. a date or time).

(iii) If possible, extra information around the subject (wow factor).

A secondary method of asking questions will be via a premium voice service. This will be set up to run alongside the primary service and will be priced at a higher level to cover the cost of having to translate the voice message into a text message before it can be answered.

How the AQA service works

The AQA service uses an intelligent Knowledge Engine together with people (researchers) to provide a system that can answer any question within a few minutes. It works as follows:

(1) Only mobile phone users can use the AQA service.

(2) Users have the option of sending a question to the premium text service or by calling the premium voice service and having their question recorded.

(3) If a question is submitted by text message it reaches the Knowledge Engine via the Mobile Network Interface and is then either answered automatically by the Engine (if possible) or forwarded to human researchers.

(4) If a question is submitted by a voice call it is first translated into text by a human researcher before submitting to the Knowledge Engine. It is then answered automatically by the Engine (if possible) or returned to the researcher.

(5) Researchers are remote based individuals, working from their own premises, accessing the system over the internet using the Knowledge Entry System.

(6) The Knowledge Entry system is a web based interface that displays a question and a list of possible answers selected by the Knowledge Engine by applying search and relevance ranking algorithms to match the question to previously answered questions and answers. The Knowledge Entry system also displays a countdown timer, and an indicator of the number of outstanding questions.

(7) Researchers answer questions that the Knowledge Engine cannot answer automatically - the Engine will suggest possible answers from a database of previously generated answers that can be chosen, or the researcher must find an answer themselves (usually by searching the internet).

(8) Researchers provide 'human' understanding, so any question worded in any way can be understood.

(9) The researcher summarises the answer succinctly, so that a good quality answer is fitted into a maximum of 160 characters (when SMS text messaging is used; for MMS, there is no such restriction).

(10) Each answer is sent as a text message (which term includes related formats such as EMS and MMS format) back to the user and also stored in the Knowledge Engine for future questions, so that knowledge builds up over time.

(11) Researchers are paid per question answered.

(12) The service runs 24 hours a day, 7 days a week.

(13) Answers are usually sent back to the user within a few minutes. If the rate of questions rises above the rate of answering, the answer may be delayed. If the delay is greater than 15mins, a text message is automatically sent to the user informing them of the delay and forecasting the time when their question will be answered.

To provide a fast response time to the majority of questions, a two tier system is used with Frontline Researchers attempting to answer all questions initially and passing hard questions to Senior Researchers.

The main principles are:

(1) Frontline Researchers have a maximum 10mins to answer each question. Also they can reject the question earlier if they know they cannot answer it. If they fail to answer it, it goes to another Frontline Researcher. After three attempts by a Frontline Researcher, the question goes on a "Hard Question" list which Senior Researchers work from. Senior Researchers have up to 1 hour to answer the question (they must provide an answer of some sort in that time).

(2) The Editor interprets an editorial policy and is responsible for the whole researcher system working effectively, ensuring good quality and consistent answers.

(3) Frontline and Senior Researchers work shifts and flexible hours. Frontline Researchers can be part-time. When there is a high rate of questions, researchers are automatically sent a text message to their own mobile phone to request they come online and get to work answering questions.

(4) If there are no "Hard Questions" the Editor and Senior Researchers can answer questions from normal question list in the same way as Frontline Researchers.

(5) All researchers have access to an *Instant Messaging* system that allows them to chat to each other over the internet if they need help answering a question.

Quality control

The key factors to making AQA an excellent service are:

A The quality of the answers.

The success factors to providing quality answers are:

1. Re-use: i.e. answers which have already been given are stored in the database of answers and can be used again.

2. Researchers provide accurate and succinct answers to questions that have not been answered previously, which in turn depends on recruiting good researchers and then training the researchers to perform well.

3. Senior researchers reviewing a sample (10%) of all answers given by frontline researchers.

3. Access to reliable sources of information.

B The timeliness in delivery of the answers.

The success factors in providing timely answers are:

1. Re-use: i.e. answers which have already been given once can be used again.

2. Some very specific classes of questions can be answered directly by the Knowledge Engine without researcher intervention such as share price, weather and news queries. In either case a target is that 80% of questions are answered by either (1) or (2) above.

Quality and timeliness is monitored by the Knowledge Engine checking answers for spelling, level of content, etc and providing statistics on researcher performance (rate of answering, number of questions skipped, etc).

System Enhancements

Researchers will be provided by the Knowledge Entry System with a list of recent (or all) previous questions and associated answers sent from a given user when answering a new question from that user. This may enable the researcher to understand better the context in which the question is being asked (which may be a follow-on question from an earlier question, which would be meaningless without a knowledge of that earlier question and the associated answer).

Researchers will also be provided by the Knowledge Entry System with an indication of the current location of the user (e.g. by using conventional automatic location finding services that are deployed in wireless communications systems). This allows the researcher to answer a question like "where is the closest petrol station?"

The question can include a picture and optionally some text or voice which the researcher then scans and determines. For example a customer could take a picture of a bottle of wine and ask where can I buy this wine, or send us a picture of a celebrity and ask "Who is this person?" The Knowledge Engine passes the image to researchers using the Knowledge Entry System, who then view/understand the image, and generate an answer. This may involve matching the image directly or translating it – i.e. describing it in words and then undertaking a search using those words.

Questions can be sent to the Knowledge Engine using packet switched data using GRPS, CDMA, WCDMA data connections (which terms also include their derivatives).

APPENDIX 1

Example Questions and Example Answers

Category	Example question	Model answer
Historical Factual / Science / History / Geography / Languages / General Knowledge / Directory Enquiries Answer not likely to change over time.	is the earth round	The Earth's shape is an oblate spheroid with average radius of 6357km from pole to pole and 6378km parallel to the equator
	is hyde-park bigger than central park	Central park is bigger being 843 acres compared to 350 acres for Hyde park
	What is the origin of the universe	The Big Bang theory suggests the universe began from a massive expansion 13 billion years ago. Georges Lemaître suggested this theory in the 1930s.
	Is a cucumber fruit or veg	A cucumber surprisingly is a fruit. A fruit is defined as the mature ovary of a plant - ie that it has seeds.
	when is my cat poppy going to give birth	Cats have a gestation period of 61 to 69 days. Before birth the mammary glands will swell noticeably and the cats body temperature will rise.'
	What are the big 5 animals	The big five animals are the Lion, Leopard, Elephant, Buffalo and Rhino. It was called the big five because shooting all five was a challenge.
	can a bullet escape gravity of the moon.	No, a bullet cannot escape the Moon's gravity. The Moon's escape velocity is 2.38km/s but the fastest bullets only travel at about 1.2km/s.
	how do I make a bomb	Sorry, but the AQA policy is not to respond to questions of this type.
	How many bones in the body?	At birth there are some 275 different bones. As the body matures some bones, such as wrist and ankle bones, fuse together leaving 206 bones in an adult.
	what famous people were born on 2 jan	Christy Turlington (35), Cuba Gooding Jr. (36), Tia Carrere (37), Roger Miller (68), Isaac Assimov (84) and Sally Rand were all born on 2 Jan.
News / Sport / Weather /	score chelsea	Score at 3.17pm is Chelsea 2 Arsenal 1, Zola scored after 3mins, Flo, 24mins, Bergkamp,

Entertainment / TV / Soaps / Celebrity /Films / Politics / Travel / Flights / Restaurant Guides / City guides / Gambling / Hotels / Traffic / Directions Answer is likely to change		44mins
	Ch sc	Chelsea won 4-0 away against Leicester City on 11 Jan 2004. The match attendance was 31,547. Chelsea are currently 3rd in the premiership on 16 Jan 2004.
	who won the rugby ~	England won the Rugby World cup 2003 on Sat 20th Oct, beating Australia 20-17 after a drop goal from flyhalf Jonny Wilkinson in last minute of extra time
	What sign is David Beckham	Taurus is David Beckham's zodiac star sign. He was born on 2 May 1975 (a Friday).
	Is flight ba223 on schdule	BA223 is 18 minutes ahead of schedule arriving at 4.02pm on 16 Jan 2004. Its scheduled arrival time was 4.20pm.'
	Where is home and away filmed	Jackaroo Ranch at Annangrove, north west of Sydney, Australia is where many of Home and Aways scenes have been filmed for the past 15 years.'
	What is the best bet in craps?	The bet in craps, a game played with two six sided dice, that has the best odds is the "behind the line" bet when a 4, 5, 6, 8, 9 or 10 has been thrown.
	Suggest a cheap restaurant in w4	Thai Bistro is a pleasant, if plain, budget restaurant to visit serving good food. You can find it at 99 Chiswick High Road, W4 2ED Tel: 020 8995 5774.
	How do I get my tv fixed near chiswick	You can get a TV repaired at BSI Electronic Products at address Unit 389, Chiswick High Road, London W4.
	Whats the name of the impersonation comedy called street something	Stella Street is the name of the comedy with impersonations. Phil Cornwelle created and starred in it.
Shopping / Products / Services	which should I buy Nokia 6600 or SE	The Sony Ericsson P900 smartphone is more PDA centric while the Nokia 6600 smartphone

/ Books / CDs / Cars / Houses /	P900	is more voice centric. Both phone run the Symbian v7 OS.
	Whats the best mobile phone deal for an infrequent user	On 16 Jan 2004 the top pay as you go mobile phones at CPW are Motorola T192(£34.99), Siemens A55(£39.99), Nokia 3310(£49.99), Nokia 3510i(£79.99)
	Give me some cheat codes for Empire Earth	Empire Earth cheat codes are: "asus drivers" reveals map, "boston food sucks" 1000 food, "atm" 1000 gold, "you said wood" 1000 wood, "creatine" 1000 iron
	What fiction book should I read. I like ian banks but want other author.	According to Amazon people who bought Iain Banks books also enjoyed Not the End of the World by Kate Atkinson. Reviewed as funny and sharp.
Business / Financial	psion sh price	Psion share price was 96.5p at 5.00pm 16 Jan 2004 with 774,000 shares traded.
	Is the stock market going to crash soon	It is not possible to predict when stock markets are going to crash. The FTSE has risen from 3,567.4 in Jan 2003 to 4,456.1 in Jan 2004.
	Who is the richest person in uk	In 2003 the richest person in the UK was estimated to be the Duke of Westminster, who has a fortune of £4.9bn. Britain has 21 billionaires.
	How many txt messages are sent per day per user in uk	35 text messages are sent per day per user on average in the UK (reported in Jan 2004).
Personal / Health	Should i kill myself	You should seek help from the Samaritans - phone 08457 90 90 90 or see www.samaritans.org
	how do I get a gf	A good way to find a girlfriend is to use internet dating sites such as: match.com, udate.co.uk, topdating.com, speeddater.co.uk
	How many headache pills can I take	You must always follow the instructions provided with headache pills and never exceed the recommended dose. If in doubt consult your doctor.
Fun / crosswords / Puzzles / gimmicks / jokes / horoscopes	What will lottery numbers be	The odds of winning any prize are 1 in 54. Jackpot is 1 in 13,983,816. Suggestion: 7, 25, 26, 27, 48, 49
	is there a god	People draw their own conclusions as to the existence of a god. Many religions believe in

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		the existence of a god or gods.
	What question cannot be answered	All questions can be answered by AQA by texting 63336
	What is the 3rd word on page 86 of the book under my bed	"The" is the most frequently used word in the English language, So without knowing the book the most likely word is "the".
	What is 7 across in times xword	In the Times Crossword for today (16 Jan 2004), there is no 7 across. Yesterday (15 Jan 2004), 7 across was "Roadworks"
	Horoscope for capricorn	Jan 2004 Capricorn horoscope: In work, a promotion or an improvement is possible. Good surprises are due and you will feel full of energy.

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CLAIMS

1. A method of generating answers to questions sent from a mobile telephone over a wireless bearer, comprising the following steps:

(a) receiving a question sent from the mobile telephone;

(b) processing that question at a first computer that (i) searches a database of previously generated answers for answers that match the question; (ii) automatically generates a list of potential answers to the question from the database; and (iii) automatically sends the unanswered question, together with the list of possible answers, out for review by one or more human researchers, connected to on-line information resources, who then select one of the answers in the list or use the list of possible answers together with information from the on-line information resources to compose an answer;

(c) sending the answer in plain text to the mobile telephone.

2. The method of Claim 1 in which the question is not restricted to any category of question types.

3. The method of any preceding Claim in which the researcher researches and writes an answer using the on-line information resources if none of the answers in the automatically generated list of possible answers is suitable.

4. The method of Claims 1 or 2 in which the first computer automatically determines the correct answer and automatically sends the answer as a message to the mobile telephone.

5. The method of any preceding Claim in which the question is sent from a mobile telephone using a premium text service.

6. The method of any preceding Claim 1- 4 in which the question is sent from a mobile telephone by the user calling a premium voice service and having the question recorded and then sent to the first computer.

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7. The method of Claim 6 in which the question is first translated into text by the researcher before being submitted to the first computer for processing.

8. The method of any preceding Claim 1 - 5 in which the question includes an image and the image is then understood, matched, and translated.

9. The method of any preceding Claim in which a web based interface is used by the or each researcher and that interface displays the question and the list of possible answers selected by the first computer.

10. The method of Claim 9 in which the web based interface also displays a countdown timer.

11. The method of any preceding Claim in which the researcher summarises the answer succinctly to fit into a maximum of 160 characters.

12. The method of any preceding Claim in which each answer is stored in the database of previously generated answers at the first computer.

13. The method of any preceding Claim in which a two tier system of researchers is used, with frontline researchers attempting to answer all questions initially and passing hard questions to senior researchers.

14. The method of Claim 13 in which frontline researchers have a maximum predefined time to answer each question and can reject the question earlier if they know they cannot answer it.

15. The method of Claim 14 in which, if a frontline researcher fails to answer the question, it goes to another frontline researcher and, after a predefined number of unsuccessful attempts by frontline researchers to answer the question, the question goes on a "Hard Question" list which senior researchers work from.

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16. The method of any preceding Claim in which all researchers have access to an Instant Messaging system that allows them to chat to each other over the internet if they need help answering a question.

17. The method of any preceding Claim in which the first computer deploys algorithms for one or more of: spell checking of answers; grammar checking of answers; content level checking of answers.

18. The method of any preceding Claim in which the first computer monitors the performance of the answer generating method and provides statistics on one or more of: question rate, rate of answering, time taken to answer by each researcher, hours logged by each researcher.

19. The method of any preceding Claim in which the researcher is automatically provided with a list of recent (or all) previous questions and associated answers sent from a given user when answering a new question from that user.

20. The method of any preceding Claim in which the researcher is automatically provided with an indication of the current location of the user.

21. The method of any preceding Claim in which the question and answer are sent using SMS.

22. The method of any preceding Claim 1 – 20 in which the question and answer are sent using EMS or MMS.

23. The method of any preceding Claim 1 - 20 in which the question and answer are sent using GPRS, CDMA, W-CDMA data connections.

24. An answer message sent as the final step in the method of generating answers as defined in any preceding Claim 1 – 23.

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25. A mobile telephone when displaying an answer message as defined in Claim 24.

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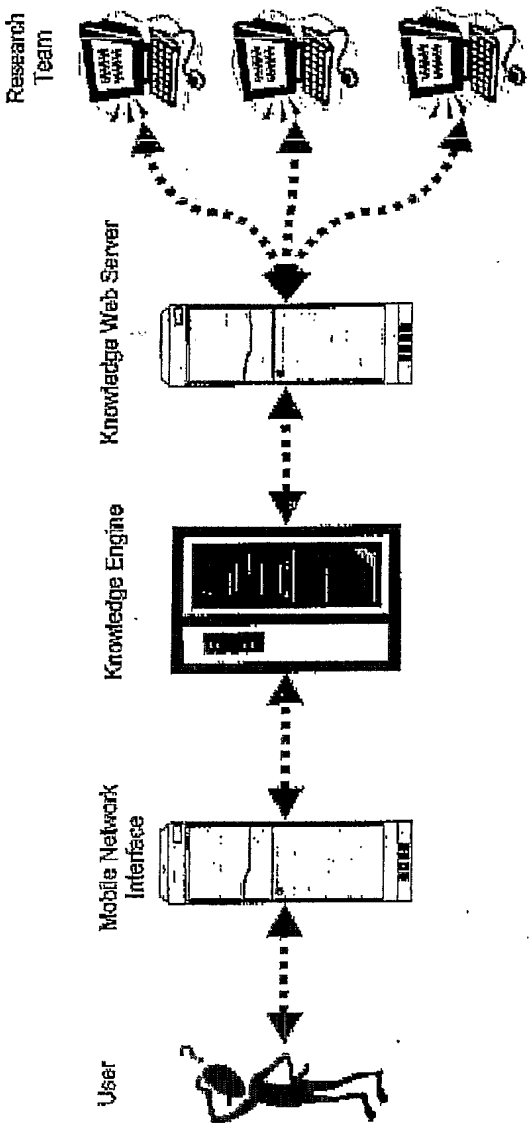
Abstract

A METHOD OF GENERATING ANSWERS TO QUESTIONS SENT FROM A MOBILE TELEPHONE

Questions sent from a mobile telephone are processed at a first computer that (i) searches a database of previously generated answers for answers that match the question; (ii) automatically generates a list of potential answers to the question from the database; and (iii) automatically sends the unanswered question, together with the list of possible answers, out for review by one or more human researchers, connected to on-line information resources, who then either select one of the answers in the list, or uses this list of possible answers together with information from the on-line information sources to compose an answer. The answer is sent back as a SMS text message.

Hence, the present invention combines the strength of current generation AI systems with the undisputed strengths of the human being to understand a question and to search, find and express an answer in cogent and concise terms. By supplying the human researchers with potential answers, this avoids many of the difficult problems of trying to implement real search intelligence in software. Further, if the researcher can pick an answer from the list then the response time in providing that answer will be far quicker than if the researcher has to research the answer directly and from scratch.

Figure 1


Research Team
Knowledge Web Server
Knowledge Engine
Mobile Network Interface
User